and sanitation, which has been organized with the following appointments: Eugene M. McCampbell, M.D., professor of preventive medicine and head of the department; Robert G. Patterson, A.B., A.M., assistant professor of public health; Emery R. Hayhurst, M.D., assistant professor of industrial hygiene; William H. Dittoe, C. E., instructor in public health engineering; Frank G. Boudreau, M.D., instructor in public health and sanitation; Lear H. Van Buskirk, B.Sc., instructor in public health laboratory methods.

THE following appointments have been made to the faculty of Case School of Applied Science: Keith F. Adamson, the University of Pennsylvania, assistant professor of mechanical engineering; Melville F. Coolbaugh, the South Dakota School of Mines, assistant professor of chemistry; Roy E. Spencer, Harward University, instructor in English; Lawrence G. Wesson, Harvard University, instructor in organic chemistry; Carl H. Wilson, Harvard University, instructor in chemistry; Arthur E. Bradley, recently of Cornell University, instructor in civil engineering; Allan A. Prior, Harvard University, instructor in electrical engineering; Perry F. Ellsworth, the Edison Electric Company, instructor in electricity and drawing; R. B. Reis, the Westinghouse Electric Company, instructor in mechanical engineering; H. F. Pasini, graduate of the Y. M. C. A. Training School of Springfield, director of the gymnasium; Bohlis Dahlman, instructor in gymnastics.

PROFESSOR H. F. WILSON, of Oregon State College, has gone to the University of Wisconsin as professor of economic entomology to take the place of Professor J. G. Sanders, who has become state entomologist for Wisconsin.

DR. R. G. PEARCE, associate in physiology, Western Reserve University, has been appointed assistant professor of physiology in the college of medicine, University of Illinois, Chicago.

DR. JAMES CRAIG NEEL has been appointed instructor in obstetrics and gynecology (on an academic basis) in the University of California Medical School.

S. H. E. BARRACLOUGH, lecturer at the University of Sydney, has been appointed to the chair of mechanical engineering.

DISCUSSION AND CORRESPONDENCE

A PROPOSED CLASSIFICATION OF THE ATTITUDE OF GEOLOGIC SURFACES

THE familiar classification of folds has long been used by the geologist in working with oil and gas. Its inadequacy for his purposes is apparent when one considers that the determining factor in the gravitational separation of gas, oil and water is not the general plane of the bed, but the actual surface constituting the roof or floor of the reservoir. This may differ from the general plane of the bed due not only to irregularity of deposition, but also to irregularity of cementation, since the reservoir frequently constitutes only a portion of the sandstone bed. A mere classification of folds will not suffice, because it is the upper or the lower surface which concerns us, and they are frequently not parallel.

A lenticular bed which lies in general horizontal is not a fold at all, nor is one lying in a plane monocline. Yet the upper and lower surfaces of either of these have an attitude which is of great moment to the oil geologist, and must be considered along with the folded surfaces.

The following classification of geological surfaces is therefore presented here in the belief that it will be applicable to other geological problems as well as to those of the oil and gas geologist. There are four prime divisions:

1. Acline—no inclination.
2. Monocline—inclination in one general direction.
3. Anticline—inclination away from a point or axis.
4. Syncline—inclination toward a point or axis.

Acline

The acline is of small importance because one finds so generally that there is at least a

slight inclination to beds, either deformational or depositional. The terrace is an acline interrupting a monocline which continues with the same dip direction both above and below the acline.

The horizontal bed is rare because (*a*) beds are generally laid down on a shore which is an inclined surface, and (*b*) when the shore is raised at the time of emergence some tilting will usually result. Even if as a whole it is flat, the upper and lower surfaces are likely to have an inclination because of differences in deposition, compacting or cementation.

Monocline

"Monocline" is a much-abused term. Some authors use it for what Scott more discriminatingly calls a monoclinal *flexure*—"a single sharp bend connecting strata which lie at different levels and often horizontal except along the line of flexure." A more desirable use is that of Grabau, Chamberlain and Salisbury, and the Century Dictionary, who follow the author of the term, H. D. Rogers, in applying it simply to beds "dipping in one direction."

The monocline may be subdivided into three primary types:

1. The plane monocline—all surfaces having a roughly similar degree of dip.

2. The anti-monocline is a curved portion of a monocline which is convex, when seen from a point perpendicular to the general surface and above it. This is a very common structure. It is readily seen that it is analogous to an anticline and would become one if the surface in general were tilted to a more horizontal position. Similarly, an anticline tilted sufficiently becomes an anti-monocline. Orton, with this aspect in mind, called it an "arrested anticline."

3. The syn-monocline is a curved portion of a monocline which is concave when seen from a point perpendicular to the general surface and above it. It bears the same relation to a syncline that the anti-monocline does to the anticline.

4. The monoclinal flexure. In addition to these fundamental units there is the very common combination of an anti-monocline passing directly into a syn-monocline below it. For this the term monoclinal flexure has long been used. To restrict the word monocline to this structure as some geologists have done is very objectionable.

5. Half-fold. This same combination is found in the half-fold, which is the whole surface from the axis of an erect anticline to the axis of an adjoining syncline; or if the anticline springs from a plane, to that plane.

Anticline

Anticlines are divisible into the following classes:

1. The *dome* is a surface dipping outwardly in all directions from a central point or line.

2. The *level axis anticline* is one where the surface is in general horizontal along the axis of the anticline. A very elongate dome may have a middle portion which is also a level axis anticline.

3. The *plunging anticline* is one having the axis itself inclined. An elongate dome is made up of two plunging anticlines, the plunges being in general in opposite directions. As stated above, a level axis anticline may intervene.

4. *Nose.* Two anticlines may cross each other. This generally produces a more or less marked dome at the intersection, which has radiating plunging axes. The anticlines are seldom of equal magnitude. If one of them is very much less than the other, it is seen merely as a wrinkle in the flank of the larger one. Since these are very common and confusion arises if they are called anticlines without qualification, the descriptive name of *nose* is proposed. A *nose* is a relatively minor plunging anticline on the flank of a much larger anticline or syncline or in a monocline. It causes the isobaths to show a mere wave in the down-dip direction.

Synclines

Applying the foregoing distinctions to synclines, we have the opposite terms—*basin, level axis syncline, plunging syncline* and *chute.*

The term *chute,* while new in this connection, is needed. It may be defined as a "minor plunging syncline on the flank of a much larger anticline or syncline or in a monocline." It causes the isobaths to make a wave in the up-dip direction.

Saddles

A saddle is a down fold in the axis of an anticline, or an up fold in the axis of a syncline. This form partakes of the nature of both an anticline and a syncline, as is evident if a model in sheet lead is turned upside down—when we find it is still a saddle, but at right angles to the original one.

For surfaces involved in recumbent, erect, carinate, isoclinal or fan folds, the present fold terms may be used without modification.

The greatly increased use of the geologic surface in economic geology has led to the proposal of this specific set of terms, for which the current nomenclature of folds was not adequate.

Roswell H. Johnson
University of Pittsburgh

THE ORIGIN OF THE "NITER SPOTS" IN CERTAIN WESTERN SOILS

In an article entitled "The Origin of the 'Niter Spots' in Certain Western Soils," which appeared in the *Journal* of the American Society of Agronomy, Vol. 6, No. 6, Professors Stewart and Peterson of the Utah Experiment Station state on pages 246, 247 and 248 of the publication cited, that,

> The brown color of the "niter spots" is produced by the solvent and decomposing action of the sodium nitrate upon the organic matter of the soil in just the same way that the black color of the black alkali spots is produced by the solvent and decomposing action of the sodium carbonate upon the soil organic matter. . . .
>
> The color (of the black alkali) is produced by the sodium carbonate, because, being the salt of a weak acid and a strong base, it readily hydrolyzes, producing sodium hydroxide, or caustic soda, which, as is well known, acts on carbohydrates, producing a brown color, the intensity of which depends on the concentration of the sodium or potassium hydroxide, thus readily accounting for the production of the color of black alkali. *Likewise, in the case of sodium or potassium nitrate, the salt being the result of this union of a strong base and a stronger acid than carbonic acid, does not hydrolyze so easily and as a result there is a smaller amount of sodium or potassium hydroxide present and necessarily the production of a milder color as observed in the brown alkali (niter) spots. The sodium and potassium sulphate and chloride, being the salts of strong acids and bases, do not hydrolyze, therefore caustic alkali is not produced, and consequently the color is not produced by these alkali salts.*

It will be seen that while the authors state that the alkali sulphates and chlorides are not hydrolyzed at all, being the salts of strong acids and strong bases, they assert that the nitrates are hydrolyzed, though to a less extent than the carbonates, being the salts of a stronger acid than carbonic. The natural inference is that the authors regard nitric acid as being a weaker acid than either hydrochloric or sulphuric.

It has long been recognized that the strength of acids depends upon their degree of ionization. In the third English edition of Treadwell's "Analytical Chemistry," Vol I., p. 16, we find that in $N/10$ solution, nitric and hydrochloric acids are both ionized in the extent of approximately 90 per cent., while in the third English edition of Ostwald's "Principles of Inorganic Chemistry," p. 248, we find the extent of the ionization of hydrochloric acid in $N/10$ solution to be 95 per cent., while that of sulphuric acid is only 57 per cent. It is thus evident that the view, commonly accepted by chemists, that hydrochloric and nitric acids are of approximately equal strength, and that sulphuric acid is considerably less strong, is correct. Since the only salts of the alkalis which are hydrolyzed are their salts with weak acids, it is clear that the sulphates, being salts of a weaker acid than nitric, should be hydrolyzed to a greater extent than the nitrates.

On page 247, Table 8, of their article, Stewart and Peterson show that while a 1-per-cent. solution of sodium nitrate dissolved 0.8 per cent. of the organic matter of a given soil, a 1-per-cent. solution of sodium sulphate extracted 1.19 per cent. of it, that is to say, 48.75